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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|--|-------------|----------------------|------------------------|------------------|
| 10/687,203 | 10/16/2003 | Makoto Yoshida | FJST 33 | 7165 |
| 61650 7590 01/16/2007 MYERS WOLIN, LLC 100 HEADQUARTERS PLAZA North Tower, 6th Floor MORRISTOWN, NJ 07960-6834 | | | EXAMINER AHN, SAM K | |
| | | | ART UNIT | PAPER NUMBER |
| | | | 2611 | |
| SHORTENED STATUTORY PERIOD OF RESPONSE | | MAIL DATE | DELIVERY MODE | |
| 3 MONTHS | | 01/16/2007 | PAPER | |

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

| | | | | |
|------------------------------|------------------------|--|---------------------|--|
| Office Action Summary | Application No. | | Applicant(s) | |
| | 10/687,203 | | YOSHIDA, MAKOTO | |
| | Examiner | | Art Unit | |
| | Sam K. Ahn | | 2611 | |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on pre-amdt, 16 October 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-24 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1 is/are rejected.
- 7) ☒ Claim(s) 2-24 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 16 October 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>031504</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Objections

1. Claims 1-24 are objected to because of the following informalities:

Appropriate correction is required.

In claim 1, line 3, "IFFT" should be "inverse fast Fourier transform (IFFT)".

In claim 2, line 3, "IFFT" should be "inverse fast Fourier transform (IFFT)", lines 11-12, "the result of subtraction" should be "the output of the subtractor".

In claim 4, line 3, "IFFT" should be "inverse fast Fourier transform (IFFT)", lines 16-17, "the result of subtraction" should be "the output of the subtractor".

In claim 6, "according 2" should be "according to claim 2".

In claim 15, line 3, "IFFT" should be "inverse fast Fourier transform (IFFT)", line 16, "and" should be deleted, line 19, "said apparatus further comprising:" should be deleted, line 20, "restoration" should be "said restoration".

In claim 16, line 3, "IFFT" should be "inverse fast Fourier transform (IFFT)".

In claim 20, line 3, "IFFT" should be "inverse fast Fourier transform (IFFT)", lines 16-17, "the result of subtraction" should be "the output of the subtractor".

In claim 21, line 3, "IFFT" should be "inverse fast Fourier transform (IFFT)".

In claim 22, line 3, "IFFT" should be "inverse fast Fourier transform (IFFT)", line 11, "after channel" should be "after the channel".

Claims 3,5,7-14,17-19,23 and 24 directly depend on claim 2,4,16 or 22.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claim 1 is rejected under 35 U.S.C. 103(a) as being unpatentable over Shirakata et al. US 6,993,083 B1 (Shirakata) in view of Nakada US 7,020,116 B1.

Regarding claim 1, Shirakata teaches a receiving apparatus (receiver incorporating a demodulator in Fig.1, note col.11, lines 15-17) in an Orthogonal Frequency Division Multiplexing (OFDM) system (note col.11, line 67) for receiving a transmitted signal (a signal transmitted is received via input to 101 in Fig.1), said apparatus comprising: a receiver (receiver incorporating a demodulator in Fig.1, note col.11, lines 15-17) for receiving a signal that has been transmitted (transmitted signal with a direct wave in Fig.6(a)) upon making the length of a guard interval added onto a known symbol larger than the length of a guard interval added onto a data symbol (guard interval GI, known symbol SYNCHRONOUS SYMBOL and data symbol of SYMBOL 1, wherein the illustration shown in proper proportion with GI shorter in length than the SYNCHRONOUS SYMBOL); and a delay-profile measurement unit (Timing Determination Device 109 in Fig.1) for measuring a delay profile of a delayed wave having a delay greater than the guard interval of the data symbol by

calculating correlation between the received signal and a known signal (measuring the delay profile by correlating the received signal output of 102 and output of synchronous symbol generator 106, and with the measured profile illustrated in Fig.6(f), the peak with C interval is selected, and further the second delay wave (c) has a delay greater than the GI of the Synchronous Symbol and Symbol 1, note col.15, lines 5-7).

Although Shirakata teaches receiving a transmitted signal (a signal transmitted is received via input to 101 in Fig.1), Shirakata does not explicitly teach receiving a transmitted signal that is the result of adding a guard interval onto a signal obtained by IFFT processing and then transmitting the signal.

Nakada also teaches an OFDM system (note col.1, line 27) transmitting and receiving signals with a guard interval (see Fig.23), wherein the transmitted signal is the result of adding a guard interval (guard interval addition unit 53 in Fig.5) onto a signal obtained by IFFT processing (IFFT operation unit 52) and then transmitting the signal (transmitting the final output of Fig.5, note col.3, lines 7-9). Nakada further teaches that guard interval is inserted to the effective data symbol in order to reduce the influence of delay waves, hence obtains a more robust OFDM system, note col.1, lines 50-65. Hence, both Shirakata and Nakada teach an OFDM system wherein the received signal incorporates a guard interval, as previously explained, wherein Nakada further suggests that the guard interval is added during transmission on the signal obtained by IFFT processing. One skilled in the art at the time the invention was made would recognize that the

system of Shirakata may as well perform the guard interval addition unit from the signal obtained by IFFT processing. IFFT processing well-known to one skilled in the art at the time the invention was made of processing time domain signals to frequency domain signals, and is critically important in an OFDM system in order to divide the carrier into plurality of subcarriers, which is also admitted as being prior art in Fig.49A of the instant application. Therefore, it would have been obvious to one skilled in the art at the time the invention was made to incorporate the teaching of Nakada in the transmitter of Shirakata by transmitting the signal by inserting the guard interval on the output of IFFT processing for the purpose of dividing the signal into frequency domain and inserting guard interval into each of the subcarriers hence reduces the influence of delay waves and obtains a more robust OFDM system, as taught by Nakada, note col.1, lines 50-65.

Allowable Subject Matter

3. Claims 2-24 would be allowable if rewritten or amended to overcome the claim objections, set forth in this Office action.
4. The following is a statement of reasons for the indication of allowable subject matter: present application discloses an OFDM system with a receiver receiving a transmitted signal having a guard interval. With excessive multipath delay, resulting in the transmitted signal to have a delay longer than the guard interval, the OFDM receiver properly receives and demodulates the transmitted signal. Prior art teaches or suggests in combination of the limitations above. However, prior art does not

teach the combined limitation of generating a delay profile of a received signal and determining intersymbol interference segment from the delay profile wherein the delay of the intersymbol interference segment is longer than the guard interval, and subtracting a copy of the intersymbol interference conforming to the intersymbol interference segment from the received signal, as claimed in claims 2,4,15,16,20 and 21. And further, prior art does not explicitly teach adding the received signal and a demodulated signal wherein the demodulated signal is based on the received signal processed, during when the delay of the intersymbol interference segment is longer than the guard interval, by FFT, channel compensation and then IFFT, as claimed in claim 22.

Conclusion

5. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Andre US 6,693,984 B1 teaches subtracting ISI estimate from a received signal and filtering the output to mitigate intersymbol interference.

Ramasubramanian et al. US 7,133,474 B2 teach determining sampling position from correlation function output.

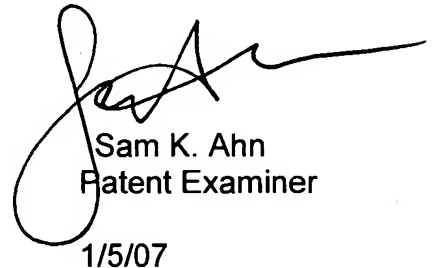
Bao et al. US 7,027,519 B2 teach OFDM system responding to multipath fading channel through re-estimation of the transmitted signal.

Art Unit: 2611

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Sam Ahn whose telephone number is (571) 272-3044. The examiner can normally be reached on Monday-Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mohammad Ghayour can be reached on (571) 272-3021. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Sam K. Ahn
Patent Examiner
1/5/07